COYOTE RESPONSIVENESS TO NOVEL VISUAL STIMULI

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Abstract: The available evidence suggests that coyotes are visual predators. Visual cues can be detected from any direction, and unlike odors and sounds, visual stimuli are relatively immune to interference from wind, rain, and ambient temperature. Nonetheless, the practical impact of visual cues on lure and bait acceptance has not been well-studied. In the present experiment, we tested the responsiveness of coyotes (*Canis latrans*) to novel black, white, and brown dowels presented in large outdoor enclosures. Each animal was presented with a randomized sequence of the three colors (1 color/trial). Latencies to detection and distances between animals and dowels at detection were scored simultaneously by two observers. The results showed that white dowels were detected at the greatest distance ($p<0.02$) and sustained greater damage than either black or brown dowels ($p<0.05$). At least in unfamiliar environments, novel color cues that contrast with background color may enhance bait detection and acceptance by coyotes. Field tests of the effectiveness of visual stimuli for coyotes is warranted.

Key words: bait, *Canis latrans*, colour, coyotes.

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INTRODUCTION

The available evidence suggests that coyotes (*Canis latrans*) are primarily visual predators (Wells and Lehner 1978), although odor and the auditory detection of prey below snow cover is also important (Gese et al. 1996, Wells and Bekoff 1982). Intuitively, this reliance on visual information is not surprising. Visual cues can be detected from any direction, and, unlike odors or sounds, visual stimuli are relatively immune to interference from wind, rain, and ambient temperature.

Among those features controlling approach or avoidance of visual stimuli, familiarity appears most important (Harris 1983). At least in familiar settings, unfamiliar object are avoided (Harris 1983). Stimuli size also influences responding. Apparently, there is an inverse relationship between object size and approach: large objects are more likely to elicit avoidance (Windberg 1997). Anecdotal reports suggest that small objects invite investigation (Roughton and Sweeny 1982).

Even though visual cues tend to be more important than other sensory information (Wells and Lehner 1978), the practical impact of visual cues on lure and bait acceptance has not been well-studied (Fagre et al. 1983). This lack of information is both surprising and potentially important, since trappers often use objects to channel coyotes in relation to traps, snares, and other control devices (Turkowski et al. 1983). In the present experiment, we investigated whether visual cues might enhance the detection and/or approach of objects in an unfamiliar environment. Like other canids (Neitz et al. 1989), coyotes lack colour vision. For this reason, we focused on cues that did or did not contrast with background vegetation.

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MATERIALS AND METHODS

Subjects

Nine captive coyotes (5 male, 4 female) from the Millville Predator Research Facility (MPRF), located 12 km south of Logan, UT, served as experimental subjects. All coyotes were ≥15 months old. One to three days prior to testing, coyotes were transported from the main kennels at the MPRF to kennels adjoining the test enclosures. Coyotes remained in the latter until the end of their individual testing.

Stimuli

Wooden dowels (25.4 cm × 2.54 cm) were painted black, white, or brown, and then air-dried for several weeks prior to use. Black was selected as a cue because of anecdotal information suggesting attractiveness to coyotes (Roughton and Sweeny 1982) and because of contrast with background vegetation (brown). White was chosen as the opposite of black, because of contrast with background vegetation, and because anecdotal information suggested avoidance by coyotes (Roughton and Sweeny 1982). Brown was selected because it matched the colour of the background.

Study enclosures

Four adjoining wedge-shaped 1 ha enclosures at the MPRF served as experimental arenas. Each enclosure extended out 160 m from a central elevated observation building to an outer arc of 125 m. Kennels under the observation buildings housed coyotes during pre-test periods. Wooden walls prevented coyotes in kennels from viewing activities in the enclosures. Native grasses and alfalfa within enclosures was mowed 10–15 cm above ground level to enhance stimulus visibility.

Procedure

A single dowel was positioned 140 m from the observation building prior to each test. Each was driven 9 cm into the ground, so that approximately 16 cm remained visible. On test days, individual coyotes were released into enclosures between 0700 and 1100 h. Each animals was watched for 90 min, or until it approached and contacted the dowel. Over successive days, each animal was presented with each of the three colours once.

Presentations were counterbalanced among individuals. Latencies to detection and distances between animals and dowels at detection were scored simultaneously by two observers. Detection was operationally defined as orientation of head and body (Bekoff 1978, Wells and Bekoff 1982) toward a dowel, followed by direct approach and contact. Distances were estimated in relation to 5 m intervals between posts for the enclosure fence. All trials were videotaped. If an animal failed to locate a dowel within 90 min, then the trial was repeated the following day. If the animal again failed to approach and contact the stimulus, it was replaced with another coyote randomly selected from the main colony. Replacements were tested with all dowel types.

At the end of each trial, coyotes and dowels were removed from the enclosures. Dowels were subsequently examined for biting. For each coyote, bite damage to the three stimuli was quantified (cm^2).

Analysis

Because of high inter-individual variability, detection distances and latencies were converted to natural log scores (Keppel 1973). These scores were evaluated in 1-way repeated measures analyses of variance. Subsequently, Neuman-Keuls post-hoc tests were used to isolate significant differences among means ($p<0.05$).

Bite damage areas were ranked and rankings were evaluated in a Friedman analysis of variance by ranks (Siegel 1956).

RESULTS

There were significant differences among log detection distances ($F=4.6$; 2,16 df; $p=0.026$), but not among detection times ($p=0.09$). Post-hoc tests showed that white dowels were detected at longer distances that black dowels, and black dowels were detected at longer distances that brown dowels (Fig. 1a). Although differences among latencies were not significant, there was an inverse relationship between latencies and log detection distance (Fig. 1b). Examination of bite damage indicated that white dowels received the most damage while black dowels received the least (Fig. 1c).

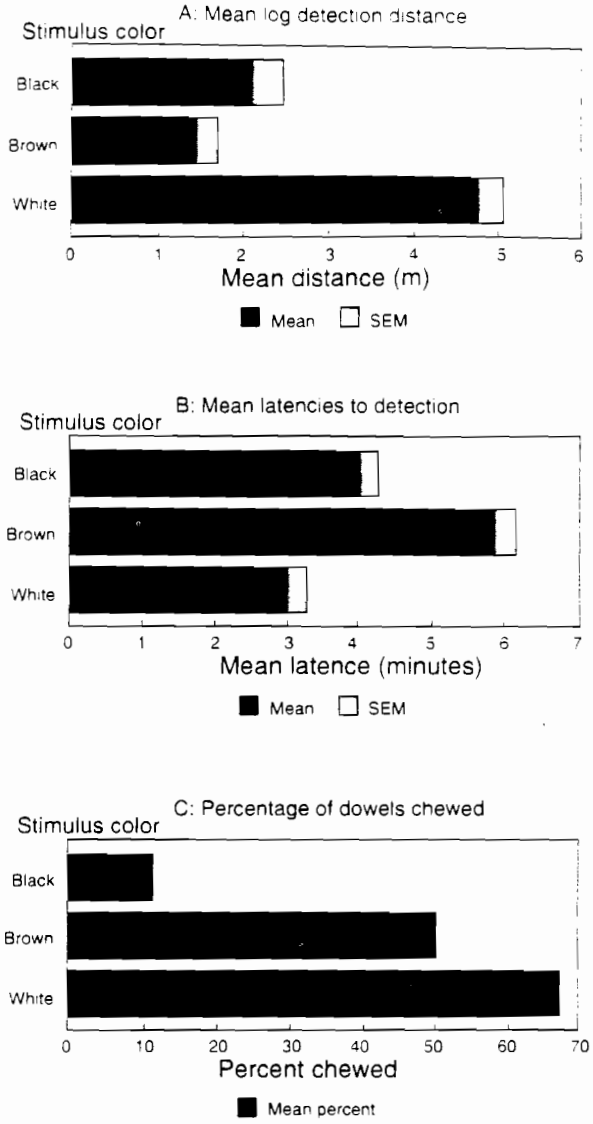

Fig. 1. (a) Mean log detection distances by coyotes for novel black, white and brown dowels. (b) mean latencies to detection by coyotes for novel black, white and brown dowels, (c) percentage of novel black, white and brown dowels chewed by coyotes.

DISCUSSION AND MANAGEMENT IMPLICATIONS

Insofar as white provided the sharpest contrast against background, it is not surprising that detection distances for this colour were greater than for brown or black. However, given anecdotal evidence that white objects are avoided by coyotes (Roughton and Sweeny 1982), it is surprising that bite damage also was greater for white than for the other colours. At least in unfamiliar contexts, white was more readily detected than black or brown, and also relatively more like to elicit approach.

While we are cautious about extrapolating from pen studies to the field, the present results have several practical implications. One is that the use of visual contrasts may enhance the delectability and approach of lures and baits. Although olfactory attractants are typically used to capture coyotes, the mean detection distances for chemical stimuli is typically ≤2m (Osterholm 1964, Windberg 1997). In the present experiment, white dowels were detected at distances of ≥4 m.

Several questions remain. Among these is the relative importance of background colour. For example, different results could obtain against a white (e.g., snow covered) background. In addition, the coyotes in the present experiment were hand-raised captives, and the possibility exist that wild free-roaming animals would behave differently. Field tests of the effectiveness of visual stimuli for coyotes is warranted.

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